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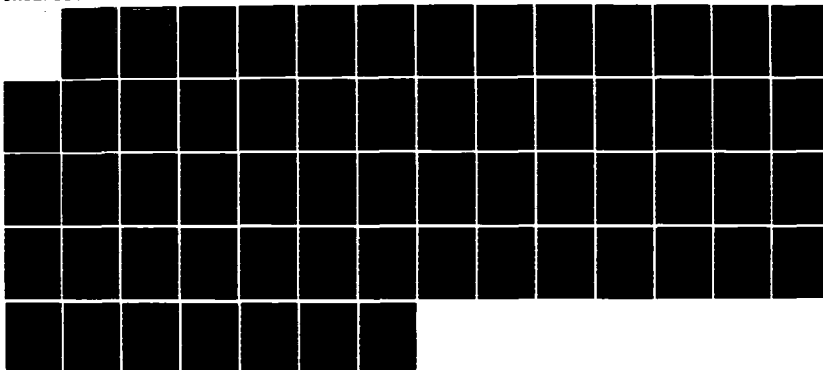
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ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL
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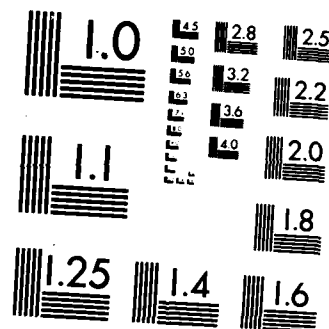
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Board on Atmospheric Sciences and Climate
 COMMITTEE ON SOLAR-TERRESTRIAL RESEARCH
 November 6-7, 1985 Meeting
 National Academy of Sciences, Washington, DC

Record of Actions1. CHAIRMAN'S INTRODUCTION

The meeting was called to order at 8:45 a.m. Dr. Intriligator welcomed the attendees and briefly discussed some of the issues that CSTR would be concerned with at this meeting: an update from each of the agencies on the implementation of the National Solar-Terrestrial Research Program; a reassessment of the health of solar physics; a discussion on the CSTR Long-Term Observations Panel's charge with its Chairman, George Siscoe; and a discussion of recent BASC activities including its reassessment of atmospheric sciences for the 1990's and the request to BASC and the Ocean Science Board from the NOAA administrator, Tony Calio, for advice on priorities within NOAA.

2. REPORT FROM NASA REPRESENTATIVE (DR. EDELSON)

A copy of Dr. Edelson's handout is presented in Appendix A.

Dr. Edelson reported that he had good news and bad news for the Committee. Spacelab II had flown in August with four solar physics instruments and had produced "spectacular" results. Dr. Edelson passed around a picture of solar granularity from the SOUP polarimeter and noted that this was "the first real demonstration of useful, state-of-the-art science on the Shuttle". He noted that a segment of the space science community has been antagonistic to the idea of the space shuttle, and has become more so as the schedule has slipped. The estimate of 10-20 missions with 8-10 being of Spacelab per year for 1985 has turned out to be a high estimate. But support from the community is now on the increase and there are more than a hundred scientific teams with experiments for the shuttle and Spacelab I, III and II have been completed. The system is coming together and working well and this includes the TDRSS satellite, the MCC (Mission Control Center) and the POC (Payload Operation Center). Spacelab is a major line of effort for NASA, said Dr. Edelson, and solar and space physics and plasma physics are benefitting most from this activity. The spectroscopic results from Spacelab II are of equally high quality to the SOUP results but are not as easily demonstrated. The helium abundance experiment also turned out very well. Dr. Edelson indicated that the good performance of the SOUP and the other instruments on Spacelab II

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will provide publicity for SOT and help build public support for it, and NASA will be issuing press releases on these successes.

Successful experiments on Spacelab II may be flown again on later Spacelab missions and the Space Station, and efforts are underway, fueled by the successes of Spacelab II, to advance the schedules. One method for advancing the schedules and saving money is to combine the "Sunlab" and "Dark Sky" instrument complements onto a single spacecraft.

Because of the success of Spacelab II, solar physics and active plasma physics experiments will be emphasized in planning for the space station. The instrument complement include the Plasma Dynamics Package with fourteen experiments, a Plasma Depletion Experiment in which thrusters will destroy the plasma inside a local bubble in which the dynamics can be studied, and there will be an experiment called the VCAP, an active ion electron gun. These experiments have worked extremely well on Spacelab II.

The SOT is an approved program for phase CD. It has encountered several problems in scheduling. Because of poor design of the spacecraft by Perkin Elmer Corporation, NASA decided to extend the scheduling of phase B. There had been two proposals in response to the RFP for the SOT; one from Hughes Aerospace which was "fatally flawed", and one from Perkin Elmer Corporation which was not of high quality. Two to three months after awarding the contract to Perkin Elmer, the Hubble telescope project at Perkin Elmer was in serious trouble, leading to a funding problem which was resolved by using SOT funds in calendar year 1983. Towards the end of calendar year 1983, Frank McDonald, the NASA chief scientist, questioned the cost of SOT which at that point was \$300 million, up from an original estimate of \$50 million. At that point, Congress was also asking questions about the program and was concerned that the approval of SOT as a new start may have been irregular. Dr. Edelson reported that all these problems with SOT had now been resolved and that the future for FY 86 had promised "clear sailing" for SOT. But the budget for OSSA will be cut in FY 86 from \$1.613 billion to approximately \$1.54 billion, a cut of approximately \$70 million. Cuts have therefore been directed across the board and, in particular, in the SOT program. The NASA requested budget for FY 86 of \$30 million would be cut to between \$5 million and \$20 million depending on whether the House or Senate levels are adopted. Dr. Edelson felt that the worst case budget for SOT would be \$10 million for FY 86.

2.1 CSTR Discussion

Dr. Schunk asked whether Congress has the expertise to make a decision on SOT funding. Dr Edelson replied that yes, they did; these decisions were not being made in the dark. Expenditures on



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SOT were now (FY 86) running at a \$10 million per year rate as a result of the continuing resolution passed by Congress to continue spending at the FY 85 rate. If the House-suggested funding level of \$5 million per year is approved by the full Congress then SOT activity would cease for the remainder of FY 86. If the \$10 million figure was approved then SOT would be continued through FY 86 with a minimum maintenance level. Dr. Edelson added that the status of the Advanced Solar Observatory is strongly coupled with that of the SOT. It is linked to it by science, not by funding. The FY 87 budget contained a request for "several tens of millions of dollars" for SOT. He also stated that SOT has higher priority than projects which have not yet been started, so that SOT would not be sacrificed to support TOPEX or ISTP. It is the firm policy of NASA to stick with the established priority list. This implies that problems with funding SOT may well jeopardize the ISTP.

At the NASA spring preview for new starts in FY 87 the priority was as follows: TOPEX, ISTP, CRAF, and AXAF. The new start list is currently subject to administrative restriction. Dr. Edelson said that he will do all that he can to place the priority new starts that are not included in the FY 87 list on the FY 88 list of new starts.

Dr. Intriligator asked whether CSTR could do anything to support NASA in its attempts to secure funding for TOPEX, SOT and ISTP. Dr. Edelson replied that the issue of SOT was extremely delicate on Capitol Hill and that he is personally managing the information flow in support of this project. He noted that if SOT funds are not available for FY 86 then the SOT project will die; the technical teams will be dispersed, and the project "will be next to impossible to restart". On ISTP and TOPEX, Dr. Edelson had nothing definite to suggest to CSTR with regard to their activity in support of these projects. Dr. Edelson noted that the technical arguments in favor of SOT have been accepted at every level of government. The real problem is to influence OMB not to target TOPEX or ISTP for elimination. If OMB orders a ten percent across the board cut in agency funding, or if there is a "no new start" order from OMB, then all programs at NASA carrying high priority will be in jeopardy. Dr. Edelson suggested that CSTR should use its influence by writing letters and by arranging meetings with key personnel, especially with people associated with OSTP who have not yet declared strong support for these projects. Dr. Edelson also suggested that CSTR could emphasize the importance of these programs to science and to improving international relations. He concluded by stressing that the problems in implementing these programs are not at the working level but are induced by the threat of the sweeping budget cuts which may be precipitated by strong moves to zero out the large national budget deficit.

Dr. Toomre congratulated NASA on its resolve to maintain the priority list of programs which have been established with so much hard work. Dr. Pomerantz commended Dr. Edelson on the statesmanlike approach that he was taking to these difficult funding issues. Dr. Edelson thanked the Committee for these expressions of support and noted that the key players on Congressional Appropriations Committee are Congressman Boland and Senator Garn, and their staffs. It would only be constructive to contact these people, said Dr. Edelson if there was a pre-existing close working relationship. The situation was extremely delicate and unstable and must be handled with extreme care. Key Members of Congress were aware of the go/no go nature of the SOT funding decision.

Dr. Edelson briefly reviewed the concept of Global Habitability as it has emerged in NASA and as it was originally presented at the United Nations Conference on Space (UNISPACE) in 1982. He noted that many of the ideas of Global Habitability were contained in the newer notion of an International Geosphere-Biosphere Program (IGBP) and that committees of the National Academy of Sciences were examining both the NASA Global Habitability initiative and the concept of an IGBP. International Council on Scientific Unions (ICSU) has tentatively endorsed the idea of an international program along the lines of IGBP/GH to be called Global Change, but Dr. Edelson noted that in the course of its evolution IGBP had changed its originally equal emphasis on all science in the earth-sun system in favor of an emphasis on biospheric interactions. NASA was now using the phrase "Global Change" to describe IGBP/GH related activities in international forums, so as to emphasize that the program is NASA's contribution to a program which is at root an international rather than a NASA program. NASA has also introduced the program to other international bodies, such as the IAF. Dr. Edelson suggested that CSTR should address the extent to which solar-terrestrial science should be included in the Global Change program.

Dr. Intriligator noted that the ad hoc planning group for IGBP of ICSU at their meeting in Frankfurt on October 5-6 had established four working groups in the following areas: (1) terrestrial ecosystems and atmospheric interactions; (2) marine ecosystems in atmospheric interactions; (3) geological processes past and present; and (4) role of solar emissions in the upper atmosphere and in relation to the earth. Dr. Intriligator noted that this last working group was to be chaired by Professor Roederer, and that CSTR would be communicating with it.

Dr. Walt inquired whether there would be a new Announcement of Opportunity for Explorer satellites. Dr. Edelson replied that CSAC, CSSP and CSAA had been asked their opinions on the Explorer program in recent years and that \$60 million per year was now being spent on the Explorer program line item in the NASA budget. It was felt in

some quarters that there were too many big, and expensive programs and too much astrophysics. A new Announcement of Opportunity was therefore in preparation by a committee under Dr. Rosendhal to rectify these perceived imbalances, and the AO would be directed at the communities of solar physics, astrophysics, space plasma physics, and earth science.

Dr. Intriligator asked whether there would be flexibility in the FY 87 budget for smaller programs to complement SOT and ISTP. Several such programs had been recommended in the CSTR report, National Solar-Terrestrial Research Program. Dr. Edelson said that there would be none. The Explorer program would continue at (at least) a \$50 million level in the FY 87 budget, but there would be no further funding increments at least until FY 88.

In reply to Dr. Toomre, Dr. Edelson said that the Sunlab and Dark Sky missions were scheduled for the end of 1987.

Dr. Walt stated that the high level of predictability of NASA programs was most important to the scientific community and was most welcome. He congratulated NASA on their success in this regard and on the high success rate. Dr. Edelson said that the letter and recommendations of groups such as CSTR were a most important part of the planning process which led eventually to the formation of a priority list. A large amount of negotiation and effort was expended in the production of this list, said Dr. Edelson, and the views of all segments of the scientific communities were carefully weighed and balanced in forming the final list. NASA therefore expected strong support from the scientific community for the priority list once it was established. The agency intended to proceed with that assumption in place.

3. CHAIRMAN'S REPORT

Dr. Intriligator said that the main purpose of the meeting was to review the operations and decisions of federal agencies in solar-terrestrial research. The NASA priority list for new starts was of particular importance in this respect because recent decisions have affected the status of CRAF, AXAF and SOT. There was also concern about the potential impact of the Gramm-Rudman-Hollings bill.

Dr. Intriligator noted that since she had briefed Dr. Edelson last June on ISTP as the prime candidate for the next new start after TOPEX, Dr. Edelson and other senior NASA personnel had convinced Mr. Beggs of the technical merits of the project and that OSTP had been helpful in their support for ISTP at OMB. But ISTP has not yet been reviewed by the Director of OMB, Mr. Miller.

With regard to CSTR panels, Dr. Intriligator reported that Dennis Hartmann, Chairman of the MAP Panel, was combining the letters drafted at the last MAP meeting into one composite letter addressed to the MAP steering committee. The new Panel on Long-Term Observations, chaired by Dr. Siscoe, would meet in the first week of December. In accordance with the Academy's advice, the Panel members have been selected to broadly represent the solar-terrestrial community. Care has been taken to avoid selecting members who might act as advocates for particular specialized scientific interests or who might have conflicts of interest. The CSTR proposal for formation of a new panel to investigate ground-based facilities for solar observations had been approved by the Board on Atmospheric Sciences and Climate and by the Commission on Physical Sciences, Mathematics, and Resources. It had then been submitted to the Governing Board of the Academy where it had been disapproved. The relevant extract from the minutes of the Governing Board is in Appendix B. Mr. Ebert who is a member of the Governing Board is the President of the Carnegie Institution and in that position was responsible for the closing of Mt. Wilson. This proposal is now being rewritten in a form which should be acceptable to the Governing Board. This will be discussed later in the meeting.

The recently formed National Commission on Space, chaired by Tom Paine, will be addressing solar-terrestrial issues and CSTR must decide how to interact with this new body. Dr. Paul Coleman is representing the solar-terrestrial research community on the Commission. Dr. Intriligator noted that the extent to which the Commission would be involved in science and in politics was not yet clear and that at this point there was no official working relationship established between the Academy and the Commission. Copies of the CSTR reports National Solar-Terrestrial Research for the 1980's and National Solar-Terrestrial Research Program had been forwarded to the Commission for their consideration.

Dr. Intriligator noted that the funding crisis at National Optical Astronomy Observatories is continuing. The future of the Sacramento Peak Observatory is unclear and the possibility of closing the High Altitude Observatory has been raised. One of the principal issues at these facilities as well as at Mt. Wilson Observatory and Clark Lake is who will be responsible for administering the facilities. AURA, NSF, and NOAA are all possible choices. The situation is becoming increasingly serious because of the diffusion of expertise away from these institutions, falling morale and chronic financial problems.

The new administrator of NOAA, Dr. Calio, has asked the Academy to review NOAA's programs with special emphasis on research activities and the balance between in-house and out-of-house research. The first joint BASC/BOS meeting of this purpose was convened on November 4, 1985, with Dr. Calio and NOAA AA's in

attendance. Dr. Calio stated at this meeting that he would like this arrangement to parallel the already successful relationship between the Space Science Board of the Academy and NASA. Dr. Calio estimated an increase of 5-10% in the NOAA budget for the coming year.

On the subject of potential reorganization within the NSF, Dr. Intriligator noted the following issues: (1) the possible merger of the Division of Astronomical Sciences with the Division of Mathematics and Physics; (2) the question of whether solar physics should remain part of the Division of Astronomical Sciences or whether it should be combined with solar-terrestrial physics to give it "critical mass" as a separate division; and (3) whether the disciplines of solar sciences and atmospheric sciences should be combined into a new division at NSF.

In response to the NSF request for a long-term assessment of the atmospheric sciences, BASC had asked for the views of two hundred members of the atmospheric sciences community including a few people in solar-terrestrial research. Of the 120 replies, only five or six specifically referred to the needs of solar-terrestrial research. A copy of all replies was made available for reference by the Committee. Dr. Intriligator announced that Dr. Hosler, Chairman of BASC, has been appointed to the National Science Board of NSF.

Dr. Intriligator reported that the draft on the IMS initiated by the Reiff panel was now available with the exception of one chapter to be prepared by the co-editors, Drs. Manka and Sugiura. CSTR members were invited to review the material and present their comments to Dr. Intriligator.

The NAS report on the IGBP, produced under the chairmanship of Jack Eddy, would be published in the next 4-6 weeks. In related developments of ICSU, the ICSU ad hoc Committee on the IGBP had set up four panels, two of which were related to the core program (Terrestrial Ecosystems and Atmospheric Interactions; Marine Ecosystems and Atmospheric Interactions) and two of which were considered "peripheral" (Geological Processes: Past and Present; Role of Solar Emissions in the Upper Atmosphere and in Relation to the Earth). The last panel was to be chaired by Juan Roederer, and it was clearly important that CSTR communicate its views to this panel on appropriate STR programs to be associated with the IGBP. The panel is due to present its report next June.

Following the decisions of the January 1985 meeting of the CSTR, Dr. Intriligator had published an article entitled "The Grand Concept for Solar-Terrestrial Research," which was published in the October 1985 issue of Aerospace America, Volume 24, No. 10, pages 68-69.

In reply to a question from Dr. Intriligator, Dr. Peacock said that his perceptions of the priority list within NSF was as follows: Global Tropospheric Chemistry, STORM, and National Solar-Terrestrial Research Program in that order. He also suggested that the connection between ISTP and the National Solar-Terrestrial Research Program does not necessarily mean that additional support for the National Solar-Terrestrial Research Program would be postponed. He was continuing to discuss this with Dr. Bierly. Dr. Peacock also raised the possibility that the new NSF supercomputer capability might be incorporated into the National Solar-Terrestrial Research Program.

Dr. Intriligator inquired whether Clark Lake and the other ground-based observatories could be successfully managed under a new user committee drawn from AURA and NSF. Dr. Pesch (NSF) said that initiatives along these lines had produced no response from the scientific community. Similar problems had been encountered with the continuation of DOE's solar neutrino experiment, which has now been transferred to the University of Pennsylvania.

4. REPORT FROM DOD REPRESENTATIVE (DR. SAGALYN)

Dr. Sagalyn summarized her presentation in four viewgraphs (Appendix C). These were entitled, Air Force Planned Solar-Terrestrial Research Space Missions, Resources in Solar-Terrestrial Research and Development, Future Directions, and Discussion Topics.

Dr. Sagalyn noted that the CRRES/SPACERAD mission will investigate the dynamics of radiation balance from an STR perspective, that a 1987 launch is anticipated and that there will be 17 experiments aboard with active involvement by NASA and 8 universities. The first viewgraph also described the Defense Meteorological Satellite Program (DMSP), which operates 2 spacecraft in a 800 km altitude sun-synchronous polar orbit, at either dawn/dusk or mid-day/mid-night local times.

Dr. Sagalyn noted that the Resources viewgraph was for Air Force R&D only; the Navy contributed an additional \$5 million to basic research for FY 87. The FY 87 Air Force total of about \$25 million was for theory, analysis and data processing; most was earmarked for universities. Integration and launch support costs are in addition to this figure. Dr. Sagalyn said that the total funding was low relative to the actual and justifiable need, and that the basic reason for this situation was a lack of awareness of the importance of space research to the Air Force mission.

On the situation at NSO, Dr. Sagalyn praised the Parker report (the Executive Summary is in Appendix L) and noted that the root of the problem from the Air Force perspective is management structure.

AURA consists of eighteen institutions of which about 10% represent solar research. Expansion had led to the influence of solar-terrestrial research being further reduced. The Air Force has signed a four-year Memorandum of Agreement to keep Sacramento Peak open for Air Force purposes. The NSF was now looking at AURA management problems and Dr. Sagalyn felt it would be wise to expand the investigation to look at other observatories such as the HAO and Mt. Wilson.

On the Strategic Defense Initiative, Dr. Sagalyn said that a joint committee had been formed with members from the Navy, NASA and the Air Force to recommend projects which should be included in SDIO initiatives.

4.1 CSTR Discussion

Dr. Walt inquired about the fate of proposals for funding from SDIO sources. Dr. Sagalyn replied that there had been about seventy "white papers" in space science and technology and that the Office of Naval Research had received sixty. She estimated that since the SDIO budget was about \$6.5 million, only about twenty-five of these proposals could be supported and that review committees would have to place the various proposals in priority order. She also noted that innovative science activities were not included in the continuing resolution for funding government operations recently voted by Congress. Dr. Walt noted that the lack of response from the SDIO was discouraging the community and that it was unwise to overexcite the community for no purpose. Dr. Sagalyn agreed, saying that there was much political pressure to create "big bangs in the sky" and that such motivations were currently dominating the choice of areas for expenditure of resources.

Dr. Toomre asked about the political discussion on SDI in the country and its effect on SDIO proposal submissions. Dr. Sagalyn said that the university response was "excellent" but that there had been some "indelicate management" by DOD.

Dr. Tuttle,, in answer to Dr. Intriligator, indicated that there were now 38 or 39 full-time equivalent positions at Sacramento Peak, compared with a high of 52 in the early 1980s. Six of these had left during the past year. At the McMath telescope facility staffing was level at approximately 24. But the budget problems were common to all observatories, and solar physics was receiving the same treatment as the other sub-disciplines. Dr. Sagalyn noted that the Air Force was contributing an additional \$200 thousand in FY 86 at Sacramento Peak, which was mitigating staff attrition. But the critical issue was how to maintain the facility as a viable observatory.

Replying to Dr. Dryer, Dr. Sagalyn said that UV remote sensing would be operational by early to mid 1990s. DMSP satellites would be equipped with a high resolution vacuum ultra-violet imagers and many vehicles would be equipped with X-ray imagers.

Dr. Sagalyn noted that a design feasibility contract had recently been concluded with APL for the construction of SIMPL, which is an interplanetary monitoring satellite for solar wind parameters and the interplanetary magnetic field.

SEMSON, which is currently budgeted at \$600 million dollars is in the Pentagon approval process where discussions center on the Statement of Need for space measurements. The approval process within NASA cannot begin until SEMSON has been cleared by the Pentagon.

Dr. Intriligator asked whether ISTP should be jointly funded by NOAA and the Air Force. Dr. Sagalyn said that it was important to do joint experiments both because of the technical benefits which accrued and because shared funding made such projects much more affordable. NOAA and the Air Force would be closely cooperating on the science and data analysis.

Dr. Dryer said that General Harris, while he was Commander-designate of the Unified Space Command, had hinted that GPS will not be funded until there is a direction to do so from above, but that he might support SEMSON before receiving explicit directions to do so. Captain Brown added that SPACOM is an operational command and does not have much activity in R&D. Dr. Sagalyn added that there was no security problem with the data on space weather after a period of 24 hours and that after this period of time access to the data would be totally unrestricted.

In answer to a question from Dr. Walt, Dr. Sagalyn said that NSF and the Air Force will share cost of operations of Sacramento Peak for the next four years. The Air Force would pay for their share of support only and the agreement can be voided on either side at any time. More steps are clearly needed to correct the morale situation.

5. REPORT BY NSF REPRESENTATIVE (DR. BIERLY)

Dr. Bierly showed a viewgraph which indicated that the percentage growth rate in AAEO was not as rapid as that in other Directorates and that the consequence had been inadequate funding for established needs in AAEO (Appendix D). Within AAEO, Dr. Bierly reported that the Division of Polar Programs and the Earth Sciences Division was being relatively successful in acquiring funding.

The recent replacement of Dr. Bridgewater by Dr. Merrell as Assistant Director of AAEO has made the budget outlook beyond FY 87

rather uncertain. Dr. Merrell, an oceanographer, has a reputation for fighting strongly and successfully for the causes he leads. But Dr. Bierly cautioned that if the Gramm-Rudman-Hollings bill is passed in its present form, there may be a reduction across the board in budgets of approximately 15% per year for several years. Mr. Bloch is assuming conservatively a base reduction of 8% for FY 87. But even in this severely constrained environment there is money available for "exciting" science. Dr. Bierly showed five viewgraphs of the fiscal state of NSF activities, the fifth one being a tabular breakdown of funding in terms of dollars and percentage increase in dollars by discipline (Appendix F). Dr. Greenfield pointed out that the percentage growth rate in solar-terrestrial funding is comparable to that of the average of other fields. Dr. Bierly mentioned that each field has a irreducible minimum spending rate which is set by the need to maintain facilities and to carry out essential repairs. Bill Gordon's Committee is currently prioritizing needs for facilities' funding in the atmospheric sciences in NSF.

5.1 CSTR Discussion

Dr. Toomre inquired about the fiscal health of NCAR, the HAO situation and the distribution of supercomputer costs at NCAR. Dr. Bierly responded that recent NCAR growth rates had been at 44.6% against an average for all grants programs of 43%. HAO growth is typical of NCAR growth rates. The next CRAY XMP is due to be delivered to NCAR in August 1987 and this was to be a delivery under a firm contract and was unlikely to be affected by budget cuts. Mr. Bloch has ordered management studies of all facilities funded by NSF, whether they are run by individual institutions or by consortia such as UCAR.

In reply to Dr. Intriligator, Dr. Bierly said that NSF has supported supercomputing this year (FY 86) to allow access to such facilities by researchers. It is up to the researchers to take advantage of these opportunities. But it is clear that there is not enough funding to support all the data analysis, modeling, and simulation studies which the community would like to see done. NSF would have to pick and choose amongst the various proposals. There will be no new sources of funding for activities of this kind in the foreseeable future. Dr. Greenfield and Dr. Bierly both praised Dr. Peacock for being highly effective and aggressive in securing support for solar-terrestrial research within the NSF. Dr. Siscoe suggested that the community be encouraged to send proposals directly to Dr. Peacock, since NSF is designed to respond to proposal pressure.

Dr. Greenfield noted that the National Solar-Terrestrial Research Program needs new money to fund its programs and cannot succeed merely by transferring resources from other ongoing programs in the field.

Dr. Schunk suggested that the supercomputer initiative in NSF, rather than the Division of Atmospheric Sciences, should have picked up the NCAR CRAY funding of approximately \$15 million, because solar-terrestrial research workers (at least) have access to other supercomputers at minimal or no charge and because many supercomputers would be underutilized over the next few years. Dr. Greenfield agreed with this point of view but emphasized that it was important to talk to Dr. Bierly and not to himself on this particular subject.

6. AN UPDATE OF SOLAR PHYSICS AT THE NSF (DR. BAUTZ)

Since the last meeting of CSTR, AURA had taken a preliminary position on the NOAO for FY 86 calling for cuts, in particular in NSO but with the provision that the Vacuum Tower Telescope be kept open. The NSF ACAS advisory committee discussed this position at their meeting in May and concluded that more study was needed. The Parker Committee was therefore established and convened in June and July. The Parker Committee report was distributed to CSTR members. It contains 7 principal recommendations, AURA has written a response, point by point, to the Parker report recommendations, concurring in 5 out of the 7 recommendations.

Dr. Bautz referred the Committee to her letter to Dr. Intriligator on the subject of the future of the NOAO and AURA which was in response to Dr. Intriligator's letter to Mr. Bloch (Appendix E). Two essential points were that AURA acknowledged the importance of solar physics to its agenda and in particular the importance of Sacramento Peak and NSO Tucson. Dr. Bautz also said that the GONG project had been most favorably received throughout the fields of astronomy and solar physics at NSF, and that planning for implementing was proceeding.

6.1 CSTR Discussion

Dr. Walt asked who wrote the AURA response to the Parker Committee recommendations. Dr. Bautz said that Peter Conti had chaired the 40-member AURA board and that John Teem, the president of AURA had prepared the first draft of the letter, and it had been reviewed by board members. There would be some replacement of people who have left since the May RIF but there was no intent to reinforce the scientific staff supported by NSF at Sacramento Peak. It was noted by Dr. Tuttle that there would be no cut-back in service to outside people and by Dr. Sagalyn that there would be increased workload for Air Force personnel. Dr. Jeffries had stated that he is "prepared to be loyal and obedient" in implementing the AURA recommendations and AURA had agreed to use corporate funds to improve morale at Sacramento Peak through the construction of recreational facilities, and similar activities.

Dr. Toomre praised the responsible reaction of NSF, and by Dr. Bautz in particular, in convening the Parker Committee so promptly, an action which had prevented a crisis from developing.

Dr. Intriligator asked whether it would be wise to institute administration of Mt. Wilson, Clark, Culgoora, and Sacramento Peak observatories through the NSF, AURA or some interagency arrangement. Dr. Bautz said that she was not quite sure how this would improve matters. The NSO experiment should be given a chance to work. After all, it was only two or three years old. Management of all the centers through a single organizational structure was unlikely to be successful as the current arrangement which encourages diversity through a large degree of autonomy in individual center management. In reply to Dr. Dryer, Dr. Bautz indicated that AURA itself was not interested in managing the observatories. Dr. Schunk stated that he felt that there was a need for a subcommittee to oversee the operations of the various solar observatories and to give input to the NSF. Dr. Sagalyn stressed the importance of the synergism in space- and ground-based observations. Both were necessary to collect an adequate data base and strong coordination would clearly be advantageous. Dr. Intriligator inquired about the suggested move of the Division of Astronomical Sciences out of the Directorate for Astronomical, Atmospheric, Earth, and Ocean Sciences and into the Directorate for Mathematical and Physical Sciences. Dr. Bautz said that this was a serious topic for discussions and the move would be a logical one since the ties were very strong between astronomy, physics, mathematics and chemistry. Clearly solar-terrestrial physics has strong links with the interest of both directorates. On balance, however, it was clear that solar physics and solar astronomy should remain as part of astronomical science. In Dr. Bautz's view, movement of solar-terrestrial physics into the directorate of mathematical and physical sciences would not adversely affect the strong cooperative ties which now exist between solar-terrestrial physics and the earth sciences.

Dr. Intriligator asked for reaction from Dr. Bautz on the suggestion that CSTR create a panel to consider the problems of ground-based solar observations. Dr. Bautz said that there had been several studies already but that in a discussion between herself, Dr. Bierly, and Dr. Merrell, it was concluded by Dr. Merrell that such a study could be most useful. Dr. Merrell may formulate a statement of what needs to be done and may request that the National Academy of Sciences conduct a study. The importance of this area of study was indicated by the number of diverse groups which had examined it in the past. Clearly the problem is much broader than solar-terrestrial research. What is ultimately at issue is the future of mathematics and physical sciences within NSF. This MPS grouping is "the core of NSF" and in the past has been very successful in securing management agreement on its programs and its funding.

Dr. Peacock noted that in a sense astronomy was a glamour component of AAEO and brought much beneficial publicity to the division. On balance, he would prefer that astronomy remain within AAEO. The best arrangement "depended on the personalities involved". Dr. Walt advocated giving the present organizational structure at NSF a fair test by letting it continue for a longer time. The risks of changing, he said, are probably larger than the risks of remaining with the present system. Dr. Intriligator referred to the "critical mass" problems, that is, the need for disciplines to group together to develop sufficient mass and visibility to have significant influence in national scientific policy. Dr. Toomre and Dr. Dryer both suggested that the sun itself should be grouped with the stars in the NSF organizational structure. The boundary between solar-terrestrial physics and astronomy could be set at the sun's photosphere. Both agreed, however, that it was probably best to leave the NSF structure as it now is.

Dr. Intriligator thanked Dr. Bautz for her presentation and in particular commended her for her handling of the situation at Sacramento Peak.

7. REPORT FROM NOAA REPRESENTATIVES (DR. BHUMRALKAR AND DR. FLETCHER)

Dr. Bhumralkar responded to the points raised by Dr. Intriligator in her letter to Dr. Fletcher, Assistant Administrator for Research at NOAA, dated October 24, 1985. A copy of Dr. Bhumralkar handout, which summarizes his presentation is contained in Appendix F.

7.1 CSTR Discussion

Dr. Intriligator asked whether there would be any increase in NOAA activity in solar-terrestrial research. Would there be workshops organized to compare theory with data, for example? Dr. Bhumralkar replied that the new administrator of NOAA, Dr. Calio, had only been confirmed in his position two weeks ago and that at this point there was no clear indication of the direction of future NOAA policy on this issue.

At this point, Dr. Fletcher joined the discussion and first noted that there is a shortfall between the operational level budget for SEL and the administration request for FY 86. Congress has not, of course, acted on the FY 86 budget but at best, it will be level funding at the FY 85 rate. Dr. Fletcher indicated that NOAA has established a list of priority items with regard to SEL. The first priority is to stabilize the situation at SEL with regard to services. The second priority is to establish the necessary research and technique development required for a responsible job at

SEL. There was a good chance that OMB would include adequate support of these activities in the FY 87 budget requirement. The third priority item is development of the X-ray imager. A request for supporting research, at least, would be included in the FY 88 NAA budget request. Dr. Fletcher said that he would welcome the advice and counsel of the committee with regard to the FY 88 budget on the subject of minimum acceptable services from SEL. The solar environment or "space weather" service is struggling: it is a "boot strap" operation and a new service. The infrastructure is not there yet to support it in the sense that the needs for the services are not yet fully recognized by the community. NOAA must have its FY 88 budget submission complete by April 1986.

Dr. Intriligator commented that some of the ground-based solar observation facilities will die if NOAA does not support them. Dr. Fletcher said that OSTP is supportive of continuing such services, that the resources were scarce, but that "we have had some successes in getting more firmly on our feet" in the FY 86 budget and probably in the FY 87 budget.

Dr. Intriligator referred to plans for the new spacecraft known as Solar-Interplanetary Monitoring Platform (SIMPL) and asked whether NOAA will be in a position to contribute towards the \$600 million required for this effort. Dr. Fletcher replied that NOAA/SEL is now working with DOD planners on this possibility but that such a joint program would be "a real structural departure for the DOC budget cycle".

Dr. Sagalyn noted that NOAA, NASA, and DOD need the data from the SEMSON missions and therefore that these agencies might consider sharing these activities and the associated costs. In his reply, Dr. Fletcher said that satellites now accounted for 40% of the NOAA budget starting from 0% in 1957. Recognition of the need for artificial satellites had resulted in very rapid growth in the NOAA satellite fleet and it could well be that the recognition of the need for solar environmental data would lead to a similarly rapid increase within NOAA in the types of services provided by SEL. If this is to occur, it is clear that the administrator of NOAA, the administrator of DOC, and the director of OMB must become convinced that it is absolutely necessary to collect solar environmental data. A coherent package must be put together by the community and the agencies, and it must be aggressively sold if a new and growing demand for such services is to be generated.

Dr. Intriligator asked whether industry might be willing to support growth of solar environmental services. Dr. Walt said that such support may be possible but that it would almost certainly be restricted to research activities.

8. IMPLEMENTATION OF THE NATIONAL SOLAR-TERRESTRIAL RESEARCH PROGRAM

Dr. Intriligator expressed concern about the presentation by Dr. Bierly of NSF which raised the possibility of funding decreases across the board by of as much as 15% per year if the Gramm-Rudman-Hollings bill is approved by the Congress. Dr. Pomerantz and Dr. Dryer both suggested that it might be wise to form an ad hoc committee on STR with particular attention to NSF support of supercomputer simulations for space plasma physics, flare modeling, and magnetic reconnection. Dr. Schunk pointed out that some work of this kind was carried out at NCAR but that access for outside researchers to the supercomputers there was available but required a formal written proposal to NCAR and to NSF for hardware support. Dr. Schunk also noted that the solar-terrestrial research community has its own supercomputer support and yet it is also taxed to the extent of \$15 million to support the NSF supercomputer initiatives. Solar-terrestrial research needs to recoup its loss, by transferring that amount from OASC back into AAEO. Another problem is that the resources available for data analysis are inadequate and are inconsistent with the resources dedicated to supercomputer access. Dr. Intriligator noted that there were 4 issues:

- o Are there additional sources of funding for supercomputer activities which have not been identified?
- o Can the supercomputer fund pay for AVM maintenance?
- o How to resolve hardware interface issues for researchers.
- o Data analysis support.

Dr. Pomerantz pointed out that if ISTP is approved then the solar-terrestrial community should be ready with appropriate publicity material, particularly for the popular press such as the New York Times science section science magazine, Nature etc. Dr. Peacock pointed out that it would be appropriate to praise NASA's efforts in support of solar-terrestrial research and Dr. Dryer emphasized the importance of linking the National Solar-Terrestrial Research Program into any publicity associated with the ISTP.

Dr. Intriligator introduced the topic of workshops as a source of publicity for the National Solar-Terrestrial Research Program. Dr. Schunk noted that there was NSF support for a workshop in aeronomy to establish the predictive capability of the worldwide data set and to investigate the consistency of theoretical models with data on the interactions between the magnetosphere, ionosphere, and atmosphere. Dr. Behnke suggested that a workshop on the subject of gravity waves is timely and would be an appropriate source of publicity.

Dr. Peacock offered to coordinate suggestions from members of the Committee on mechanisms to publicize the National Solar-Terrestrial Research Program. He invited members to forward ideas and proposals for action to him so that he could investigate these initiatives and report back to the Committee.

Dr. Intriligator mentioned that additional publicity material was required from the federal agencies, in particular, from NOAA and from Captain Harrison at DOD. Material was also required on the relevance of magnetospheric physics and plasma physics to cosmology and astrophysics. The Committee also needed to give further thought to the role of the American Physical Society and the American Institute of Physics in publicizing the National Solar-Terrestrial Research Program and associated activities.

Dr. Toomre said that he and his colleagues had published the cover article in the September issue of Scientific American. The article was on helioseismology, and was apparently a factor in the decision by Science magazine to devote the cover to a related paper by the same authors. These papers had been used by Walter Sullivan for an article in the New York Times Science section and had been picked up by the Herald Tribune. Dr. Toomre felt that the publicity had influenced NASA in their selection of the priority placing of ISTP in the new start list because of the publicity accorded some of the lesser known applications of the ISTP. The popularity of the GONG initiative had also been increased through the publicity.

9. PANEL ON LONG-TERM OBSERVATIONS

Dr. Siscoe, the Chairman of the CSTR Panel on Long-Term Observations, wanted to know why the draft charge to the Panel had been changed from his original suggestion (Appendix G). Specific items had been removed and the charge had been made more general. He was concerned that the scope of the charge as presently formulated might be too wide. This was clearly a matter of importance since the Panel's report will presumably lay out what needs to be monitored and will act as a guide in setting the monitoring requirements of the solar-terrestrial research community.

Dr. Intriligator replied that the impetus for the formation of the Panel had come from NOAA as a result of the threatened closure of SEL. Two years ago a formal request had been received from NOAA for CSTR to identify the parameters which needed to be measured; their priority, frequency, and precision, etc. DOD had strongly seconded this proposal. At the time, two years ago, the development of the National Solar-Terrestrial Research Program was CSTR's highest priority and NOAA's request was temporarily delayed. But pressure from NASA, NOAA, DOD, and NSF and from CSTR members had led to action being taken to form the present Panel on Long-Term Observations.

Dr. Dryer added that further reasons for forming the Panel were that NSF had tended to view monitoring as a low priority activity which was clearly not research in their view; that NOAA was not primarily a funding agency and could not support much monitoring activity with its current budget; and that NASA, because of its

mandate, was not supporting ground-based observations but only spaced-based observations.

Dr. Intriligator said that the purpose of the Panel was to establish an unbiased list, properly prioritized on long-term observations necessary to support the important scientific areas in solar-terrestrial research. To this end, Panel members had been selected for their specialized knowledge as well as for their broad representation of the solar-terrestrial community. Advocates for particular causes, and government personnel had been excluded from consideration for membership. With regard to polling members of the solar-terrestrial community on a prioritized list of long-term observations, Dr. Peacock said that Dr. Joe Allen could provide an extensive mailing list of potential respondees and the results of previous surveys of limited scope. Dr. Schunk said that it would be important to keep detailed records of those people who are asked for their views and of those who responded, so that the Panel's reports could be demonstrated to be representative of the views of the solar-terrestrial community. Dr. Intriligator suggested that an announcement in EOS, or a flyer distributed with EOS might be an appropriate way to gather responses from the community. Dr. Sagalyn suggested that an announcement at the next AGU meeting might be appropriate.

Dr. Intriligator said that it was important to link the work of the Panel to the recommendations of recent Academy's reports. In particular, the four principal recommendations of the report Solar-Terrestrial Research for the 1980's and the recommendations of the Colgate I and II reports.

With regard to archived data sets, Dr. Toomre pointed out that glass plate data may be of more use than magnetic tape data. Its useability and documentation is often superior and interpretation of that data is often simpler than that for magnetic tape data.

Dr. Siscoe expressed his understanding that the Panel would be a legislative body, and that execution of recommendations would be through the CSTR and directed to the ICCSTR.

Dr. Schunk suggested that Dr. Siscoe discuss the work of the Geophysical Data Panel with Peggy Shea. The last meeting of the GDP was to review the activities of the NGDC, headed by Dr. Joe Allen.

Dr. Potemra asked whether broad data sets such as the LANDSAT data set should be included in the Panel's investigation and Dr. Intriligator replied that this was not part of the charge of the Panel. Although if there was some clear relevance to solar-terrestrial research, reference to such data sets could be woven in to the Panel's report. This led to a general discussion on the subject of data management and the recommendations of the Shea-

Williams report. Dr. Sagalyn pointed out that there was not much interest by upper management in the problem of data storage and data access. Interest must be stimulated by the scientific community and strong user support must be constantly expressed to the agencies. A plan for a data access network is urgently needed.

10. REPORT FROM OSTP REPRESENTATIVE (DR. RICHARD JOHNSON)

Dr. Johnson opened by stating that the Gramm-Rudman-Hollings bill will certainly impact the scientific community because the budget impact could be a reduction of as much as \$35 billion a year for several years, and because social programs and some defense programs would be partially or totally protected. NASA, therefore, would be vulnerable to budget cuts as would science budgets across the board. For FY 86, the NASA/OSSA budget would probably show an increase of 7-8%, with the overall NASA budget remaining frozen at the FY 85 level. The FY 87 budget proposal is in OMB and the fate of space science is not clear. The philosophy and impact of the Gramm-Rudman-Hollings bill is still being examined within OMB. But the message is clear, science will be on the defensive for the next few years. The scientific community must emphasize and publicize within the government the importance of science to the nation. The national economy has evolved from its roots in agriculture and heavy industry and science is now an essential part of the long-range health of the country. In particular, it was important to maintain the scientific talent base, both to keep industrial competitiveness up and to maintain military readiness. The maintenance of a strong science base was of particular concern in NASA where the budget was increasingly being devoted to operational systems. OMB as well as OSTP recognized that there was a need to reverse the direction of this trend. But the prime directive and responsibility of OMB was to cut the budget.

With regard to ISTP, Dr. Johnson said that Dr. Keyworth had indicated that the absence of a new start last year was an exceptional circumstance which could not be repeated this year, and that Dr. Keyworth was "relatively optimistic" for at least one new start this year.

Dr. Johnson showed a viewgraph (Appendix H) of OSTP activities in space sciences and he made the following comments:

- o The Assistant Director for Space Science and Technology position performs an important function for the science community. Dr. Johnson anticipates that he will hold this position for at least another year.
- o The Report of the President's National Commission on Space is due in March. OSTP will prepare recommendations for implementation of a long-term strategy, to be presented to

SIGSPACE. No federal agencies are represented in the membership of the Commission.

- o The requirement for a "vigorous and balanced space science program" was written into the President's Directive on National Space Strategy. Within the Space Station Office, space science issues are accorded high visibility, largely through the efforts of the Peter Banks Committee. Dr. Johnson agreed that monitoring of "space weather" falls naturally into an extension of NOAA's mandate, and said that OSTP supported the view that NOAA should perform this activity and expand it. He also acknowledged, in answer to Dr. Sagalyn, that cooperative funding of spacecraft activities between DOD and NOAA (such as the SIMPL program) was to be encouraged.
- o The OSTP report on agencies' roles in Earth Sciences is due at the end of December 1985.
- o Lou Lanzerotti's Space and Earth Science Advisory Committee of the Advisory Council will look at how the science community can best provide advice to NASA on balanced funding of NASA space science activities.
- o OSTP is strongly in favor of an international cooperative project in science, particularly in satellite missions.

10.1 CSTR Discussion

Dr. Sagalyn stated that the budget for SDIO was \$6.5 in FY 86 but that few of these resources were being used to fund outside research. Did OSTP have a role in changing the situation? Dr. Johnson replied that OSTP staff had talked to Dr. Ionson and General Abramson on this problem and that there was a recognized need within SDIO "for science rather than phenomenology." But Dr. Johnson added that SDIO was project-oriented and therefore preferred that NASA be responsible for basic scientific research. Because the amount of resources within SDIO was relatively small, Dr. Johnson recommended that CSTR not spend too much time in attempting to gain access to these funds.

Dr. Dryer inquired about the "trans atmospheric vehicle." Dr. Johnson noted that such a vehicle which would carry large payloads from a conventional horizontal take-off into near orbital conditions by combining on-board hydrogen with atmospheric oxygen was now technically feasible and had attractive commercial applications.

Dr. Alfven asked Dr. Johnson to comment on the waning of emphasis on natural philosophy in order to stress technological and military applications of new scientific discoveries and made a plea

for the restoration of strong emphasis on natural philosophy. Dr. Johnson said that this point was well taken. The present national perception was that scientific understanding was to be welcomed and was to be supported as much of the fine arts are supported. Applications were perceived as being far more important. Dr. Johnson said that this situation should be changed, especially within Congress and such a change was essential for the health of the nation. He added that such a change in perception was also important in other countries, notably in Europe.

Dr. Intriligator expressed concern about the condition of ground-based facilities for solar-terrestrial research and asked for Dr. Johnson's views on the implications for the health of solar-terrestrial research and on the question of which ground-based solar facilities to fund, and how to manage them. Dr. Johnson replied that the OSTP FCCSET would welcome problem-identifying input from the CSTR on this subject. Sacramento Peak, said Dr. Johnson, was a subset of the major problem which was that there had been an "inadvertent change of focus" in the astronomical community. For example, there had been a lack of coordinative support for SOT in NASA, and this project had been perceived as non-urgent both in the scientific community and in Congress. Dr. Johnson agreed with Dr. Toomre that there had been "benevolent neglect" of SOT. But this was a result of a lack of expressed community support for this project. The NASA budget for space science, both ground-based and spaced-based, amounted to \$1.5 billion and the manner in which these funds were spent was determined by competition, which introduced stability into the process of non-uniformed distribution of resources. There was a need to carefully manage change in the sense of departures from historical trends, in the dominance of space science. Dr. Johnson expected that SOT would be funded at least at a \$10-15 million rate this year which will be adequate to keep the program alive.

Dr. Intriligator asked whether CSTR could provide other useful input to OSTP. Dr. Johnson said that new information relative to the National Solar-Terrestrial Research Program would be valuable and that previous communications from CSTR on this subject to Dr. Keyworth and Dr. Edelson of NASA had been "helpful." A look at the output of the National Solar-Terrestrial Research Program by CSTR would also be useful, including an addendum or update on the current status and a reaffirmation or refinement of its purposes. Dr. Peacock made the comment that recycling of report recommendations at least over 3-5 years intervals was important for maintaining report viability, feasibility, and credibility within the NSF.

11. CSTR ACTION ITEMS, PLANS AND STRATEGY

Dr. Intriligator initiated a discussion on the subject of ground-based facilities for solar observations. It was agreed that

important recommendations for the science in solar physics and solar-terrestrial research had been identified in the two CSTR reports: Solar-Terrestrial Research for the 1980's, and National Solar-Terrestrial Research Program together with the Colgate Reports and the Field report. The charge to the new CSTR Panel on Ground-Based Solar Observations was discussed and Dr. Dryer stressed the importance of radio frequency observations in solar research.

It was agreed that a modified charge should be included in the proposal to the NRC's Governing Board for establishment of the new Panel (Appendix I). The Committee decided to prepare a "white paper" to the ICCSTR on the subject of management problems at ground-based facilities for solar research and Drs. Sagalyn, Toomre, and Pomerantz were asked to draft this with assistance from Dr. Peacock (Appendix J).

Dr. Intriligator mentioned two other issues on which CSTR might provide information to the ICCSTR. These were: the issue of the collection of "solar weather" data by NOAA and DOD; and, the issue of data archival and dissemination, especially as expressed in the Shea-Williams report. Dr. Sagalyn offered to prepare a draft letter on the subject of solar weather for Dr. Fletcher of NOAA, and Dr. Peacock offered to work on the issue of data archival and dissemination.

The letter from Dr. Hosler announcing a major assessment of the state of the atmospheric sciences by the Board on Atmospheric Sciences and Climate was discussed (Appendix K). It was concluded that the letter emphasized the classical atmospheric sciences, and consequently, severely underemphasized the relatively new areas of atmospheric sciences associated with solar-terrestrial research. The letter had not made clear what was included in atmospheric sciences for the purpose of the BASC investigation and it was felt that the responses to the Hosler letter from the solar-terrestrial community had consequently not been representative of the strong interest of the community in the future of atmospheric sciences. Dr. Dryer called for a lobbying campaign to correct the imbalance and Dr. Schunk said that the composition of BASC should be balanced with reference to all areas of atmospheric sciences. There had been only five responses out of over 100 received which had represented the solar-terrestrial community and this was clearly unbalanced and inadequate. Dr. Pomerantz suggested that conclusions of recent CSTR reports should be included in the BASC report on atmospheric sciences. Dr. Perry, Staff Director of BASC, agreed to examine the situation and to correct the imbalances perceived by the members of CSTR by incorporating recommendations from CSTR reports in the BASC report on atmospheric sciences. An NSF plan, which is now being generated, for the future of aeronomy until the year 2000, was also mentioned and the importance of CSTR contributions to this report was emphasized.

Dr. Intriligator announced that the next meeting of CSTR would occur in April or May unless an emergency meeting was found to be necessary, perhaps because of the passage of the Gramm-Rudman-Hollings bill. Dr. Intriligator called for a list of nominees for replacement of members of CSTR who would be rotating off the Committee at the end of June 1986, and also nominations for chairman.

Board on Atmospheric Sciences and Climate
COMMITTEE ON SOLAR-TERRESTRIAL RESEARCH
National Academy of Sciences
Joseph Henry Building, Room 453
2100 Pennsylvania Avenue, N.W.
Washington, D.C.

TENTATIVE AGENDA
Monday, 23 April 1986

8:45 a.m.	o Coffee	
9:00 a.m.	o Opening of Meeting	Intriligator
9:05 a.m.	o Space Station and Solar-Terrestrial Research o Representative will make a short presentation and then will be available for answering questions	Banks
9:40 a.m.	o Chairman's Report o Action items since last meeting o Meeting Agenda	Intriligator
10:25 a.m.	o Coffee	
10:35 a.m.	o CEDAR Program o Representative will make a short presentation and then will be available for answering questions	Sharp
11:00 a.m.	o Funding and Solar-Terrestrial Research	F. Johnson
11:30 a.m.	o Start general discussion on implementation of National Solar-Terrestrial Research Program o Funding prospects o Strategy	Intriligator/ Group
12:15 p.m.	Lunch in meeting room	
1:00 p.m.	o National Science Foundation o Agency representative will be available for answering questions	Merrell

Continued...

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Monday, 28 April 1986 (Continued)

2:00 p.m.	o Continue general discussion on implementation of National Solar- Terrestrial Research Program o Funding prospects o Strategy	Intriligator/ Group
3:15 p.m.	o Coffee	
3:30 p.m.	o National Aeronautics and Space Administration o Agency representative will make a short presentation and then will be available for answering questions	Edelson
4:30 p.m.	o Continue general discussion on implementation of National Solar- Terrestrial Research Program o Funding prospects o Strategy	Intriligator/ Group
5:00 p.m.	o Discussion of next day's agenda o Action items	Intriligator/ Group
6:15 p.m.	o Dinner at La Maree Restaurant, 1919 I Street, N.W., one block from JH Building, for those who wish to attend	

Tuesday, 29 April 1986

8:45 a.m.	o Coffee	
9:00 a.m.	o National Oceanic and Atmospheric Administration o Agency representative will make a short presentation and then will be available for answering questions	Bhumralkar
9:40 a.m.	o Department of Defense o Agency representative will make a short presentation and then will be available for answering questions	Sagalyn
10:20 a.m.	o Coffee	
10:30 a.m.	o OSTP view on status of Space Science	R. Johnson

Continued...

Tuesday, 29 April 1986 (Continued)

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|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| 11:00 a.m. | <ul style="list-style-type: none">o Start general discussion on Committee of Solar-Terrestrial Research (CSTR) action items, plans, and strategyo Suggestions for new studies and activitieso Date of next meeting | Intriligator Group |
| 12:15 p.m. | <ul style="list-style-type: none">o Lunch in Meeting Room | |
| 1:00 p.m. | <ul style="list-style-type: none">o Continue general discussion on Committee of Solar-Terrestrial Research (CSTR) action items, plans, and strategyo Suggestions for new studies and activitieso Date of next meeting | Intriligator Group |
| 3:00 p.m. | <ul style="list-style-type: none">o Adjourn | |

LIST OF ATTENDEES

Members

Devrie Intriligator, Carmel Research Center
Martin Walt, Lockheed
Maha Ashour-Abdalla, UCLA
R.W. Schunk, Utah State University
Peter Sturrock, Stanford University
Martin A. Pomerantz, Bartol Research Foundation
Joseph E. Salah, MIT
Juri Toomre, University of Colorado
Tim Killeen, U. of Michigan
Murray Dryer, NOAA Space Env. Lab.

Ex-officio member

M. A. Shea, FGL

Invited Speakers and Guests

Peter Banks, Stanford University
William Sharp, NSF
Francis S. Johnson, University of Texas-Dallas
William Merrell, NSF
Burton Edelson
Rita Sagalyn, AFGL
Nick Krull, DOT/FAA
Richard Behnke, NSF
Dennis Peacock, NSF
John Lynch, NSF
Stan Shawhan, NASA-HQ
Bill Sharp, NSF
Joe Allen, NOAA/NESDIS
Richard Grubb, NOAA/SEL
Capt. Ed Harrison, DOD/OUSDRE
Seth Tuttle, NSF
Bill Merrell, NSF
B. Edelson, NASA-HQ
Chandrakant Bhumralkar, NOAA/OAR
Richard Grubb, NOAA/SEL
Robert D. Chapman, OSTP
Kurt Riegel, NSF
John Perry, BASC

Staff

Peter Abel, NRC
Raquel Stanton, NRC

Board on Atmospheric Sciences and Climate
COMMITTEE ON SOLAR-TERRESTRIAL RESEARCH
National Academy of Sciences
Joseph Henry Building, Room 351
2100 Pennsylvania Avenue N.W.
Washington, D.C.

REVISED AGENDA
Wednesday 6 November 1985

8:30 A.M.	o Coffee	
8:45 A.M.	o Opening of Meeting	Intriligator
9:00 A.M.	o National Aeronautics and Space Administration o Agency representative will make a short presentation and will then be available for answering questions	Edelson
10:00 A.M.	o Chairman's Report o Action items since last meeting o Meeting Agenda	Intriligator
10:45 A.M.	o Coffee	
11:00 A.M.	o Department of Defense o Agency representative will make a short presentation and will then be available for answering questions	Sagalyn
11:30 P.M.	o Start general discussion on implementation of National Solar-Terrestrial Research Program o Funding prospects o Strategy	Intriligator/ Group
12:00 P.M.	Lunch in the Meeting Room	
1:00 P.M.	o National Science Foundation o Agency representative will make a short presentation and will then be available for answering questions	Bierly
2:00 P.M.	o Update on Solar Physics as viewed from the NSF	Bautz
3:00 P.M.	o Coffee	

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Wednesday 6 November 1985 (Continued)

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|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| 3:15 P.M. | o National Oceanic and Atmospheric Administration
o Agency representative will make a short presentation and will then be available for answering questions | Fletcher |
| 4:15 P.M. | o Continue general discussion on implementation of National Solar-Terrestrial Research Program
o Funding prospects
o Strategy | Intriligator/
Group |
| 5:00 P.M. | o Discussion of next day's agenda
o Action items | Intriligator/
Group |
| 6:15 P.M. | o Dinner at La Maree, 1919 I Street, N.W., one block from JH Building, for those who wish to attend | |

Thursday 7 November 1985

- | | | |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| 8:45 A.M. | o Coffee | |
| 9:00 A.M. | o Strategic Defense Initiative
o Agency representative will make a short presentation and will then be available for answering questions | Ionson |
| 9:30 A.M. | o CSTR Panel on Long-Term Observations | Siscoe |
| 10:15 A.M. | o Coffee | |
| 10:30 A.M. | o Start general discussion on Committee on Solar-Terrestrial Research (CSTR) action items, plans, and strategy
o Suggestions for new studies and activities
o Date of next meeting | Intriligator/
Group |
| 11:00 A.M. | o Office of Science and Technology Policy
o Representative will make a short presentation and will then be available for answering questions | Johnson |
| 12:00 P.M. | o Lunch in Meeting Room | |
| 1:00 P.M. | o Continue general discussion on CSTR action items, plans, and strategy
o Suggestions for new studies and activities
o Date of next meeting | Intriligator/
Group |
| 3:00 P.M. | o Adjourn | |

Board on Atmospheric Sciences and Climate
COMMITTEE ON SOLAR-TERRESTRIAL RESEARCH
November 6-7, 1985 Meeting
National Academy of Sciences, Room 351
2100 Pennsylvania Avenue, NW
Washington, DC

LIST OF ATTENDEES

Committee Members

Devrie S. Intriligator, Chairman
Hannes Alfven
Murray Dryer
Martin Pomerantz
Robert Schunk
Juri Toomre
Martin Walt

Liaison Representatives

Chandrakant Bhumralkar, NOAA
Nick Krull, DOT
Dennis Peacock, NSF
Rita Sagalyn, AFGL

Liaison Contacts

Richard Behnke, NSF
Eugene Bierly, NSF
Capt. Lorin L.W. Brown, ONR
Richard Greenfield, NSF
Capt. Edward Harrison, USAF
John Lynch, NSF
Peter Pesch, NSF
William Sharp, NSF
Seth Tuttle, NSF
Tim Eastman, NASA
Kurt Riegel, NSF

Ex-Officio Members

George L. Siscoe

NRC Staff Members

Peter Abel
Sylvia Beale
Richard Hart
Thomas O'Neill
John Perry
Thomas Usselman
Fred White

Invited Guests

Laura Bautz, NSF
Burton Edelson, NASA
Richard Johnson, OSTP
Timothy Killeen, U.MI
Thomas Potemra, OSTP
Joseph Fletcher, NOAA

Board on Atmospheric Sciences and Climate
COMMITTEE ON SOLAR-TERRESTRIAL RESEARCH
National Academy of Sciences
Joseph Henry Building
2100 Pennsylvania Avenue, N.W.
Washington, D.C.

REVISED AGENDA
Thursday, 25 April 1985
Room 356

8:30 A.M.	o Coffee	
8:45 A.M.	o Opening of Meeting	Intriligator
9:00 A.M.	o National Science Foundation o Agency representative will make a short presentation and will then be available for answering questions	Bierly
9:45 A.M.	o Chairman's Report o Action items since last meeting o Meeting agenda	Intriligator
10:30 A.M.	o Coffee	
10:45 A.M.	o Earth-Mars Aeronomy Orbiter	Brace
11:15 A.M.	o Start general discussion on implementation of National Solar-Terrestrial Research Program o Funding prospects o Strategy	Intriligator/ Group
12:00 P.M.	o Lunch in the Meeting Room	
1:00 P.M.	o National Aeronautics and Space Administration (NASA) o Agency representative will make a short presentation and will then be available for answering questions	Edelson
1:45 P.M.	o Continue discussion on implementation of National Solar-Terrestrial Research Program o Funding prospects o Strategy	Intriligator/ Group
2:15 P.M.	o Middle Atmosphere Program (MAP) o April meeting report o Future Plans	Hartmann/ VanZandt

Thursday, 25 April 1985 (Continued)

- | | | |
|-----------|-----------------------------------------------------------------------------------------------------------------------------|------------------------|
| 3:15 P.M. | o Coffee | |
| 3:30 P.M. | o Continue discussion on implementation of National Solar-Terrestrial Research Program
o Funding prospects
o Strategy | Intriligator/
Group |
| 5:00 P.M. | o Discussion of next day's agenda
o Action items | Intriligator/
Group |
| 6:15 P.M. | o Dinner at La Maree, 1919 I Street, N.W., one block from JH Building, for those who wish to attend | |

Friday, 26 April 1985

Room 355, Joseph Henry Building

- | | | |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| 8:45 A.M. | o Coffee | |
| 9:00 A.M. | o NSF supercomputer initiative | Connolly |
| 9:30 A.M. | o Solar physics as viewed from the NSF | Bautz |
| 10:00 A.M. | o Start general discussion on Committee on Solar-Terrestrial Research (CSTR) action items, plans, and strategy
o Suggestions for new studies and activities
o Membership
o Date of next meeting | Intriligator/
Group |
| 12:00 P.M. | o Lunch in JH Cafeteria, Committee Room 2 | |
| 1:00 P.M. | o Continue general discussion on CSTR action items, plans, and strategy
o Suggestions for new studies and activities
o Membership
o Date of next meeting | Intriligator/
Group |
| 2:00 P.M. | o National Oceanic and Atmospheric Administration (NOAA)
o Agency representative will make a short presentation and will then be available for answering questions | Fletcher |
| 2:30 P.M. | o Continue general discussion on CSTR action items, plans, and strategy
o Suggestions for new studies and activities
o Membership
o Date of next meeting | Intriligator/
Group |
| 3:30 P.M. | o Adjourn | |

Board on Atmospheric Sciences and Climate
COMMITTEE ON SOLAR-TERRESTRIAL RESEARCH
April 25-26, 1985 Meeting
National Academy of Sciences
2100 Pennsylvania Avenue, NW
Washington, DC

List of Attendees

Committee Members

Devrie S. Intriligator, Chairman
Odile de la Beaujardiere
Murray Dryer
Janet Luhmann
Martin Pomerantz
Arthur D. Richmond
Robert W. Schunk
Richard S. Stolarski
Peter Sturrock
Juri Toomre
Thomas E. Vanzandt
Martin Walt

Ex-Officio Members

Margaret Ann Shea

Others

Mukul Kundu, University of
Maryland

NRC Staff

Peter Abel
Sylvia Beale
Fred White

Liaison Representatives

Richard Benhke, NSF
Chandrakant Bhumralkar, NOAA/PDC
Nick Krull, FAA
Dennis Peacock, NSF
Rita C. Sagalyn, AFGL
Shelby Tilford, NASA
William Sharp, NSF

Liaison Contacts

Capt. L.W. Brown
Lt. Col. Gerald Dittberner
Captain Edward Harrison, Jr.

Invited Guests

Mary C. Barber, NOAA
Laura Bautz, NSF
Eugene Bierly, NSF
Larry Brace, ASFC
Currie Downie, NSF
Burton Edelson, NASA
Joseph Fletcher, NOAA
Donald Hunt, University of Colorado
R.G. Johnson, OSTP
Larry Lee, NSF
Thomas Potemra, OSTP
Seth Tuttle, NSF

Board on Atmospheric Sciences and Climate
COMMITTEE ON SOLAR-TERRESTRIAL RESEARCH
National Academy of Sciences, Board Room
2100 C Street, N.W.
Washington, D.C.

AGENDA
Monday, 28 January 1985

- 8:45 A.M. • Coffee
- 9:00 A.M. • Opening of Meeting Intriligator
- 9:05 A.M. • National Science Foundation Bridgewater
• Agency representative will make a short presentation and will then be available for answering questions
- 9:45 A.M. • Action items since last meeting Intriligator
• Meeting agenda
- 10:15 A.M. • Start general discussion on implementation of National Solar-Terrestrial Research Program
• Funding prospects
• Strategy
- 11:15 A.M. (a) Air Force representative will make a short presentation and will then be available for answering questions Sagalyn
(b) Response to CSTR request for overview of DOD solar-terrestrial activities
- 11:45 P.M. • Lunch in the Board Room
- 12:00 P.M. • National Aeronautics and Space Administration Edelson
(NASA)
• Agency representative will make a short presentation and will then be available for answering questions
- 1:15 P.M. • National Oceanic and Atmospheric Administration Engelmann
(NOAA)
• Agency representative will make a short presentation and will then be available for answering questions
- 1:45 P.M. • Strategic Defense Initiative Office (SDIO) Ionson
• Agency representative will make a short presentation and will then be available for answering questions
- 2:15 P.M. • Middle Atmosphere Program (MAP) Hartmann
• Status
• Future Plans
• November meeting in Japan
- 2:45 P.M. • Continue discussion on implementation of National Solar-Terrestrial Research Program
• Funding prospects
• Strategy

Monday, 28 January 1985 (Continued)

- 3:15 P.M. ● Overview of OSTP involvement in solar-terrestrial research Johnson
● Agency representative will make a short presentation and will then be available for answering questions
- 3:45 P.M. ● Coffee
- 4:00 P.M. ● Continue discussion on implementation of National Solar-Terrestrial Research Program
● Funding prospects
● Strategy
- 5:00 P.M. ● Discussion of next day's agenda
● Action items
- 6:15 P.M. ● Dinner at La Maree, 1919 I Street, N.W., one block from JH Building, for those who wish to attend

Tuesday, 29 January 1985

- 8:45 A.M. ● Coffee
- 9:00 A.M. ● Cosmogonic Strategy: Interdisciplinary Approach to the Origin of the Solar System Alfven
- 9:30 A.M. ● Global Oscillation Network Group (GONG) Liebacher
● Representative will make a short presentation and will then be available for answering questions
- 10:00 A.M. ● Start general discussion on Committee on Solar-Terrestrial Research (CSTR) action items, plans, and strategy
● Suggestions for new studies and activities
● Date of next meeting
- 10:30 A.M. ● Coffee
- 10:45 A.M. ● Continue general discussion on CSTR action items, plans, and strategy
● Suggestions for new studies and activities
● Date of next meeting
- 12:00 P.M. ● Lunch
- 1:00 P.M. ● Report on CSSP activities Krimigis
- 1:30 P.M. ● Continue general discussion on CSTR action items, plans, and strategy
● Suggestions for new studies and activities
● Date of next meeting
- 3:30 P.M. ● Adjourn

Code Designator for Group Described: _____

CPSMRASSEMBLY or COMMISSIONBoard on Atmospheric Sciences & ClimateDIVISION, OFFICE, or BOARDCommittee on Solar-Terrestrial Research
COMMITTEEPanel on Long-Term ObservationsSUB-UNITStaff Officer: Peter Abel

STATEMENT OF TASK

(Make clear what is expected of the group described. Include any contractual obligation under which the group bears responsibility. Limit to not more than this page.)

The Panel is to identify measurement needs for research on solar-terrestrial phenomena requiring long-term observations.

A report will be produced after a study period of 18 months which

- (a) identifies areas of research requiring long-term data records;
- (b) specifies the measurements needed to support this research;
- (c) specifies the quantities to be measured, their precision, accuracy and dynamic range, and the frequency of measurement, or if occasionally, according to what schedule, and the duration of measurement.

October 25, 1985

(date of statement)

COMMITTEE RECORDS FORM #1

Board on Atmospheric Sciences and Climate
COMMITTEE ON SOLAR-TERRESTRIAL RESEARCH
January 28-29, 1985 Meeting
National Academy of Sciences, Board Room
2100 C Street, N.W.
Washington, D.C.

LIST OF ATTENDEES

Committee Members

Devrie S. Intriligator, Chairman
Hannes Alfven
Odile de la Beaujardiere
Murray Dryer
Janet Luhmann
Martin Pomerantz
Arthur D. Richmond
Richard S. Stolarski
Peter Sturrock
Juri Toomre
Thomas F. VanZandt
Martin Walt

Ex-Officio Members

Dennis L. Hartmann
Tom Krimigis
Margaret Ann Shea

CPSMR Chairman

Herbert Friedman

NRC Staff Members

Peter Abel
Richard Hart
Janice Marrow
Judy Marshall
Tom Usselman

Liaison Representatives

Joe Allen, NOAA/NGDC
Richard Benhke, NSF
Richard S. Greenfield, NSF
John Leibacher, NOAA
James Ionson, SDIO/DOD
Dennis Peacock, NSF
Nick Krull, FAA
Stanley D. Shawhan, NASA
Rita C. Sagalyn, AFGL

Invited Guests

Albert Bridgewater, NSF
Burton Edelson, NASA/OSSA
Rudolph Engelmann, NOAA
Richard Johnson, OSTP
Thomas A. Potemra, OSTP

Liaison Contacts

Lt. Col. Gerald Dittberner
Captain Edward Harrison, Jr.

Code Designator for Group Described: CSTR

CPSMR
COMMISSION
Board on Atmospheric Sciences
and Climate
BOARD

Committee on Solar-Terrestrial Research
COMMITTEE

SUB-UNIT

STATEMENT OF TASK

The Committee on Solar-Terrestrial Research (CSTR) was established in late 1965 for the purpose of (1) responding to requests from government agencies for scientific advice on projects or programs in solar-terrestrial physics, (2) providing a mechanism for organizing cooperative projects among U.S. scientists, (3) taking initiatives in scientific planning as needed, and (4) coordinating U.S. researches with those in other countries. Upon creation by the International Council of Scientific Unions of the Inter-Union Commission on Solar-Terrestrial Physics (IUCSTP) in January 1966, the CSTR began serving as the U.S. national committee for IUCSTP. In 1973, IUCSTP was changed to the Special Committee on Solar-Terrestrial Physics (SCOSTEP), and in 1978 SCOSTEP was converted into the Scientific Committee on Solar-Terrestrial Physics. SCOSTEP's central task is the planning and organization of international cooperative programs in solar-terrestrial physics requiring a great deal of coordination. The CSTR helps in the planning process and organizes U.S. participation in these programs.

The CSTR conducts studies and sets up panels as needed for the domestic and international responsibilities as described above. The following are examples of current or recent activities: (1) study of upper atmosphere research in the 1980's (domestic); (2) study of solar-terrestrial research for the 1980's (domestic); (3) the International Magnetospheric Study (international program with a panel and, during the IMS data analysis phase, assistance in organizing associated coordinated data analysis workshops (CDAW's); (4) workshop/study of the problems of magnetospheric theory and review of the adequacy of IMS data to solve them (domestic); (5) the Middle Atmosphere Program (another international program with a panel); (6) input to the Solar Maximum Year (international program); (7) a study of the management of solar-terrestrial data (joint panel with the Space Science Board Committee on Solar and Space Physics).

1 November 1983
 (date of statement)

COMMITTEE RECORDS FORM #1

Code Designator for Group Described; CSTR/MAP

CPSMR
COMMISSION
Board on Atmospheric Sciences
and Climate
BOARD

Committee on Solar-Terrestrial Research
COMMITTEE
Panel on Middle Atmosphere Program
SUB-UNIT

STATEMENT OF TASK

One of the functions of the Committee on Solar-Terrestrial Research (CSTR) is to coordinate U.S. researches in solar-terrestrial physics with those in other countries and serves as the U.S. national committee to the Scientific Committee on Solar-Terrestrial Physics (SCOSTEP) of the International Council of Scientific Unions.

The Middle Atmosphere Program (MAP) is a plan, organized by SCOSTEP, for the coordinated global study of the composition, chemistry, structure, energetics, and motions (on all scales) of the middle atmosphere (the region from the tropopause to the lower thermosphere), and its interactions across its boundaries, considered as a unitary physical system. MAP covers the period 1982-1985.

The CSTR established the Panel for Middle Atmosphere Program to organize the U.S. participation in MAP, with the following responsibilities:

- (i) To identify those scientific objectives described in the MAP plan to which research activity in the U.S. can contribute;
- (ii) to catalogue such activities and their status (already existing, planned, or potential);
- (iii) to identify gaps in observational coverage and to explore (e.g., with government research funding agencies) the possibility of bridging these gaps with expanded or added research efforts; and
- (iv) to develop ways that U.S. efforts can best be integrated with the international plan.

January 1985

(date of statement)

COMMITTEE RECORDS FORM #1

Code Designator for Group Described: _____

<u>CPSMR</u>	<u>Committee on Solar-Terrestrial Research</u>
<u>ASSEMBLY or COMMISSION</u>	<u>COMMITTEE</u>
<u>Board on Atmospheric Sciences & Climate</u>	<u>Panel on Long-Term Observations</u>
<u>DIVISION, OFFICE, or BOARD</u>	<u>SUB-UNIT</u>

Staff Officer: Peter Abel

STATEMENT OF TASK

(Make clear what is expected of the group described. Include any contractual obligation under which the group bears responsibility. Limit to not more than this page.)

The Panel is to identify measurement needs for research on solar-terrestrial phenomena requiring long-term observations.

A report will be produced after a study period of 18 months which

- (a) identifies areas of research requiring long-term data records;
- (b) specifies the measurements needed to support this research;
- (c) specifies the quantities to be measured, their precision, accuracy and dynamic range, and the frequency of measurement, or if occasionally, according to what schedule, and the duration of measurement.

October 25, 1985

(date of statement)

COMMITTEE RECORDS FORM #1

03/06/86

Committee on Solar-Terrestrial Research
Panel on Long-Term Observations
Minutes of Meeting
February 24-25, 1986

1. Attendance and Agenda

The Panel met in executive session at 8:45 a.m. on 24 February to review progress so far and to establish the strategy to be adopted in preparing the Panel's report. A variety of speakers presented information on the gathering, archiving and application of solar-terrestrial data and discussed their conclusions with the Panel. The meeting closed with an executive session on the afternoon of 25 February.

A list of attendees is in Appendix A; the agenda is in Appendix B.

2. The opening executive session

Dr. Siscoe welcomed members to this second meeting of the Panel, and briefly reviewed progress thus far.

Dr. Baker reported that there had been a "substantial discussion" of the Panel's work at a meeting of the NRC Committee on Solar and Space Physics (CSSP) on 7-8 February.

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distribution unlimited

Half of those present had indicated that they had not received the Panel's questionnaire (see last meeting's minutes), and fresh questionnaires were provided to them. Dr. Siscoe noted that 101 replies and 16 letters had been received in response to the approximately 1200 questionnaires which had been mailed to selected members of the solar-terrestrial community. Copies of these responses are contained in Appendix C. The responses to question #1 (what observations are needed?) had been "very broad," said Dr. Siscoe. New observations suggested by a large majority of respondees to question #2 were:

- o upstream solar wind data;
- o soft X-ray, UV images of the sun;
- o geoelectric fields;
- o polar cap potential;
- o solar p modes; and
- o magnetospheric electric fields.

Dr. Jokipii noted that a complete spectrum of measurements of electromagnetic and corpuscular radiation was essential if linkages between the elements of the solar-terrestrial system were to be adequately detailed.

Dr. Baker mentioned that Stan Shawhan (NASA HQ) had discussed the issue of AE indices at the CSSP meeting and the

amenability of the Japanese to take responsibility for these measurements.

Dr. Siscoe raised the issue of continued data collection from the IMP 7 and 8 spacecraft, which are currently the only spacecraft gathering solar wind data in the vicinity of the Earth. The Panel agreed that a letter should be sent (via CSTR and the NRC Report Review Committee) to Frank McDonald (NASA). It was agreed that the letter should stress the scientific rationale for continuing to collect IMP data. The associated major issues of the availability of spacecraft tracking facilities, and the desirability of collecting ICE data were also considered, and it was agreed that the Panel would discuss these issues with Stan Shawhan and then prepare a draft letter to be edited by Dr. Siscoe and submitted to Dr. Intriligator for her approval.

The minutes of the last meeting (Appendix D) were reviewed by the Panel and approved after a discussion and modification of paragraph 3. It was agreed that the phrase "long-term observations" was more closely synonymous with "regular and persistent measurements with no perceivable cut-off" than with "continuous observations" as stated in the minutes.

The Panel noted that no single federal agency has the mandate for long-term solar-terrestrial data gathering and archiving. It was agreed that this issue should be discussed in detail at a later point and that the perceived problems might be solved either by changes in agency responsibilities or by the appointment of an independent oversight committee "with teeth." A more fundamental problem was the budget available for gathering and archiving solar-terrestrial data and its distribution among the agencies. The creation of a single line item for these purposes in the federal budget was clearly desirable.

The Panel discussed the lists of solar variables requiring long-term observation which had been submitted by Panel members. Peter Foukal's list is appended to the minutes of the last meeting (Appendix D). The remaining lists are contained in Appendix E. Dr. Jokipii stated that high time resolution would be necessary to resolve the hydrodynamics of turbulence in the solar wind. The energy and momentum budgets of the solar wind have large contributions at this scale (about 0.1 sec.). High time resolution is not needed continuously, however. A few times a day should be sufficient. But the structure of shock waves is a function of position in the 11-year solar cycle and is also a function of magnetospheric state. The performance characteristics of the measurements

will clearly require careful attention by the Panel. It was agreed that the panel must resolve the following dilemma:

- o Keeping it simple is the key to getting long-term data bases; and
- o Important scientific drivers must not be overlooked.

Dr. Siscoe suggested adding 2 criteria to the 4 stated in his "Dear Colleague" letter of 3 January (Appendix D). They were

- (5) the suggested long-term observations must be justifiable in terms of linkages; and
- (6) the suggested long-term observations must be simple [i.e. require no extreme effort] to collect.

The Panel agreed that statements on these two points could be included in the introduction to Chapter IV of the Panel's report.

3. Ionospheric Data and Geomagnetic Indices (Joe Allen, NOAA/NGDC)

A summary of Dr. Allen's presentation is in Appendix G. The presentation (and those in sections 4-10) were on the subjects of:

- (1) problems in gathering, archiving and distributing solar-terrestrial data;
- (2) identifying those data sets which are the most threatened and the most critical; and
- (3) estimating the size and identity of the user population and how it is changing.

Points which Mr. Allen emphasized were:

- o Digitized data volumes have been growing "exponentially over the last 10 years or so." Last year the increase was 33%. The largest source of digital data is NOAA spacecraft. The Air Force is the next largest source (Solar Optical Observing Network [SOON] + DMSP data + Radio Solar Data Network [RSDN]). Anticipated future sources: (1) Scanning X-ray photometer (on an experimental basis) on a NOAA polar orbiter; (2) Greater sensitivity range for particle sensors on GOES satellites; (3) Solar x-ray telescope on a future GOES satellite, which would require storage of about 1.3 Gbyte/month.
- o Auroral images from DMSP are being archived on film, but the original digital data is discarded;

o Digital data (mostly magnetometer data) is supplied by France, Canada, UK, Australia and Japan. Other countries supply analog data;

o In FY 85 there were 2200 requests, 900 for publications, 900 for data and 400 for information. 16% requests are from government agencies, with DOD and NASA heading the list. 14% of requests are from industry, 9% from the public, 19% from Academia, 42% from foreign countries.

The panel raised the following questions:

1. Will videodiscs be used as a storage medium at NGDC?
The answer was yes, as data becomes available in that format;

2. What is the strategy for data selection and for station closing? No attempt to discard superfluous data is made within NGDC, said Mr. Allen; policy on station closure is not set within NGDC;

3. Given the grossly uneven geographical distribution of mapped stations between the global hemispheres, what is the meaning of spherical analysis of data sets from these stations?;

4. The decision to prepare and archive digital data from the original analog data (magnetometer line records, for example) is only acceptable if the digital resolution is high enough to preserve all of the original analog information. This is not always the case, and valuable data is being lost;

5. The ability to continue archiving activities at NGDC is called into question by the Gramm-Rudman-Hollings law (GRH). Present trends indicate zeroing out the NGDC budget before the national annual budget deficit reaches zero, but the possibilities of personnel cuts, changes in GRH legislation and changes in user fee structure can be marshalled to prevent this dire consequence.

4. Ground-based Solar Synoptic Data (Helen Coffey, NOAA/NGDC)

Helen Coffey's presentation is summarized in Appendix H.

The Panel noted the rich menu of data described by Mr. Allen and Ms. Coffey. From these presentations it appeared that the problem areas to be addressed by the Panel were more in the areas of the sponsoring of data collection and in the organization of data distribution than in the area of data collection itself. Selectivity had been used at WGDC in commissioning new data sets, but old data sets never die.

There was a large variability in the demand for a given data base as a function of user.

5. Long-Term Ionospheric Synoptic Data (Art Richmond, NCAR)

Dr. Richmond presented 2 viewgraphs (Appendix I) on long-term measurements to assist interpretation of Incoherent Scatter (IS) radar observations.

There are now 6 IS radars, operating only several days/month. For 1-3 days/month all 6 radars operate at the same time (see viewgraph #2). A long-term data base is now available covering "a few solar cycles."

Although a global system for observing the thermosphere does not currently exist, there is a program for developing new ground based optical measurements for this purpose called CEDAR (Coupling of Energetics and Dynamics of Atmospheric Regions). Adequate monitoring of the thermosphere can be obtained either through an appropriate global CEDAR network or through global IS radar measurements. Both would require satellite optical measurements to fill data gaps between ground stations.

There was also a need for the following measurements:

- interplanetary magnetic field;
- solar wind density and velocity (IMP 8 data does not provide adequate coverage);
- solar UV flux (10.7 cm flux is now used as an indicator of UV flux but direct measurement of EUV flux at several wavelengths is desirable);
- geomagnetic indices (about 100 stations per hemisphere); and
- global ionosonde measurements to complement IS radar data.

6. Uses of Long-Term Solar Data Bases (Jack Eddy, HAO)

Dr. Eddy distributed a list entitled "Unanswered questions for which long-term solar data bases are needed" (see Appendix G). The "Gleissberg cycle" is the postulated 80-year cycle in sunspot number which is apparently present in the record available for the interval 1700A.D.- present (Appendix J). There was a discussion of the accuracy of the historical record of sunspot number, the amplitude of the odd-even cycle, and extrapolation of the record to cycle 22. On the Gleissberg cycle it was noted that:

- it shows up clearly in the auroral data record; but
- there is no evidence for it in ^{14}C data.

The Gleissberg cycle could be a statistical anomaly, but over the past 25 years agreement between sunspot number and 10 cm flux is "quite good" (except at low sunspot numbers).

The ^{14}C data (figure 5) shows increasing variability with increasing time before the present. The increase in variability is too great to be explained by the half life of ^{14}C , and is "probably due to real changes in climate." The solid curve is the calculated variation of the Earth's magnetic field, which correlate well with the ^{14}C concentration relative to ^{12}C . If the strong correlation is due to changes in solar particle flux reaching the Earth's atmosphere it should also show in the ^{10}Be ice record, but the present evidence is ambiguous.

7. Long-Term Solar Observations: The Role of HAO (Bob MacQueen, HAO)

Dr. MacQueen summarized the two observational initiatives of HAO at Mauna Loa:

- The K corona meter, which measures the polarization - brightness product of the inner solar corona from 0.05 to 1.5 solar radii above the limb. This instrument is the last one of its type operating in the world, and operates on average for 217 days/year. It has been in service since 1965 except for 2 periods of regrettable inactivity covering the ascending phase of the solar cycle.

The two goals are to measure long-term changes in the form and structure of the solar corona, and to observe mass ejection transient events in the corona with high temporal cadence;

- The chromospheric variability monitor, operating at calcium K wavelength to produce solar images. The purposes are (1) to provide a cross-calibration of the White and Livingstone measurements of the spectral profile of calcium K over an extended period of time; and (2) to specify a measure of chromospheric activity of the sun as a star for use as correlative measurements for new experiments to be set-up at Lowell Observatory and at NSO.

At Tucson there is a Fourier tachometer which produces a 2-dimensional Doppler map of the solar surface. The goals are (1) to specify the solar oscillatory modal spectrum as a

function of solar longitude, and (2) to provide the large scale velocity field at the solar surface. The instrument was built in collaboration with NSO and was recently moved from Sacramento Peak. There are 2 resolution modes: 20 and 5 arcseconds/pixel.

At NCAR there is an instrument for measuring solar diameter. It has been in use for the past 4 1/2 years for 155 days/year on average, making 300 measurements per day. Preliminary results indicate no temporal trend in solar diameter.

HAO, in collaboration with Lowell Observatory, Penn State, NSO and U. Illinois, is in the final construction phase of a "stellar cycles instrument." This will be mounted on the Lowell telescope to measure synoptic chromospheric activity of the cooler stars. It will measure at H, K and infrared wavelengths and will be crosschecked with the chromospheric variability monitor at Mauna Loa.

A new generation polarimeter is being designed for measuring Stokes parameters. It will be used in an "episodic program," for 3-4 years and then the program will be terminated. This activity involves the University of Sydney, the University of Hawaii, NSO and HAO.

On the question of budget:

- Continuation of the Mauna Loa station is "unclear." Proposals for funding are pending at several agencies. \$150K/year is required;
- The stellar cycles instrument is now in the base budget (as is the Mauna Loa station) but may have to be removed from the base budget beginning in FY88 as a result of Gramm-Rudman-Hollings (GRH). This instrument program requires \$40K/year;
- The first programs to be adversely affected by GRH will be the long-term measurement programs.

HAO is involved in several space-based observation programs. There are almost exclusively coronal. Skylab (1973-74) collected a data set of brightness and polarization data from 0.05-6.0 solar radii above the limb. The Solar Max Mission (SMM) coronagraph polarimeter has collected a total of 65,000 coronal images during 6 1/2 months of 1980 and (after in-orbit repair) from 4/84 to the present.

Archiving plans for space data are as follows. There is a complete photographic archive of 35,000 SKYLAB images, with

multiple copies. There is an archive of 8,000 digitized images which is refreshed every 6 months. SKYLAB housekeeping and calibration data are also archived. SMM data archival is proceeding smoothly, but more slowly.

There was a brief discussion of SPARTAN and the "Doppler dim" method of deriving the velocity and temperature of the solar wind. SOT was discussed, and HAO's intent to become a regional data center for SOT.

The operation of the Mauna Loa facilities with automatic equipment was debated, and it was pointed out that this would cost about \$500K. Someone would still have to be present at the site to set up and close down the equipment.

8. Uses of Solar Data by NOAA/SEL (Gary Heckman)

Dr. Heckman's viewgraphs and notes are in Appendix K. Copies of "SESC: Glossary of solar-terrestrial terms" (August 1984) were circulated. The viewgraphs provide a concise summary of Dr. Heckman's presentation on how data are used by NOAA/SEL in predicitions, and on which are the most critical data bases.

9. Solar and Interplanetary Observations from Space (Peggy Shea, AFGL)

Appendix L contains a copy of viewgraphs shown by Ms. Shea. They are self-explanatory. Launch of the SIMPL is planned for 3 years from now, provided that there are no delays caused by availability of the Shuttle or by the impact of Gramm-Rudman-Hollings. The cost of SIMPL is less than that of the WIND satellite; WIND can do the job SIMPL is meant to perform but only if it is reconfigured. SIMPL data will be made available to the public 60 days after data collection.

10. NASA/NOAA plans for monitoring the solar UV spectrum (Dr. Rottman)

Dr. Rottman's viewgraphs have been copied into Appendix M.

The portion of the solar UV spectrum of most interest lies at wavelengths above 100nm. Below this wavelength measurements are difficult to make and to calibrate. Changes in intensity in the spectrum are of interest over a wide range of period which include both the period of solar rotation and the period of the solar cycle.

Viewgraph #2 illustrates the spectral changes observed from rocket sondes between solar maximum and solar minimum. (See also viewgraph #3.)

The absolute accuracy requirements for UV instruments are severe, ranging from 5-10% at 120nm to 1% at 170nm. Current capability using the Bureau of Standards' Synchrotron UV Radiation Facility (SURF) and transfer standards is about 10%.

SME Lyman alpha measurements from 1982-1985 are shown in viewgraph #5.

Long-term solar variations measured by SME are shown in the table in viewgraph #6.

Solar ultraviolet irradiance measurements made and planned are illustrated in the final viewgraph. SUSIM is an NRL instrument which will attempt the best available in-orbit calibration procedures. It is hoped that 5% absolute accuracy will be achieved. SOLSTICE will ratio the solar UV spectrum to that of 20 selected blue stars chosen for their relative UV spectral stability. An accuracy in the ratio of 1% is anticipated. SAN MARCO is a European satellite instrument which will cover the range 200-700nm.

11. Closing executive session

The next and probably final meeting will be held in Washington to facilitate contact with agency representatives. It will be held either in May or September. September 8, 9 were suggested.

Dr. Siscoe noted that the sense of urgency which spurred the formation of the Panel had not been present in the comments of the invited speakers. The speakers had been primarily concerned with the effects of the Gramm-Rudman-Hollings bill. The central issue to be addressed by the Panel now appeared to be to ensure long-term viability of the observatories, not to shore up an imminent collapse of the data system (as is implied in the charge to the Panel). To lay out the detailed scientific rationale for collecting long-term data sets would therefore be a central purpose of the Panel's report. A second important purpose would be to define and justify the minimum components of a long-term data set.

Dr. Siscoe agreed to prepare a rough outline of the report, to include the selection criteria already agreed, and to give work assignments to each Panel member for completion before the next meeting. The assignments would include a redrafted list of critical observations and required

measurements, the scientific rationale for each component on the list, and a statement of management issues to be addressed by the Panel.

Dr. Siscoe also agreed to circulate a draft of the letter to NASA on IMP measurements to the Panel for their comments.

END

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